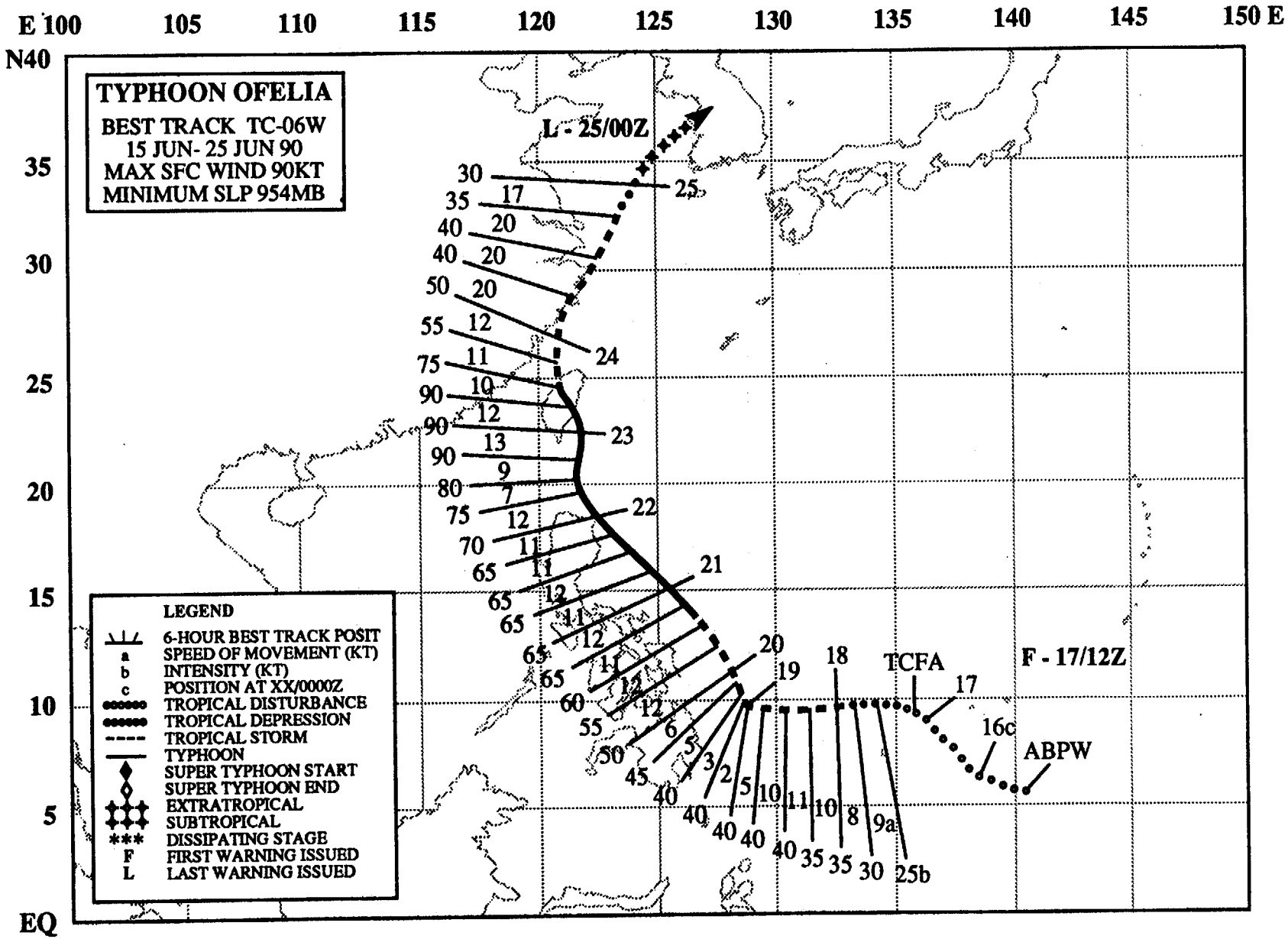
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EQ
TYPHOON OFELIA
BEST TRACK TC-06W
15 JUN- 25 JUN 90
MAX SFC WIND 90KT
MINIMUM SLP 954MB
L - 25/00Z
F - 17/12Z
TCFA
ABPW
LEGEND
6-HOUR BEST TRACK POSIT
a SPEED OF MOVEMENT (KT)
b INTENSITY (KT)
c POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
SUBTROPICAL
*** DISSIPATING STAGE
F FIRST WARNING ISSUED
L LAST WARNING ISSUED

# TYPHOON OFELIA (06W)

## I. HIGHLIGHTS

Ofelia was the third western North Pacific typhoon of 1990 and the first for the month of June. It moved toward the Philippine Islands, then slowed and turned to the northwest. Ofelia became the second tropical cyclone of the year to hit Taiwan and the first to affect the east coast of China. After recurvature, the extratropical remnants of Ofelia crossed Korea, unusual for a June system.

## II. CHRONOLOGY OF EVENTS

150600Z - First mentioned on Significant Tropical Weather Advisory as an area of persistent convection with estimated maximum winds of 15 kt.

170430Z- Tropical Cyclone Formation Alert based on increased convection during diurnal minimum, more curvature to the cloud bands, and better outflow aloft.

171200Z- First warning due to improved cloud signature.

180000Z- Upgraded to tropical storm prompted by an intensity estimate of CI 2.5.

201800Z- Upgraded to typhoon based on well-defined central dense overcast and overshooting cloud tops.

230000Z- Peak intensity - 90 kt (46 m/sec) - based on appearance of an eye and a CI 5.0 estimate.

231800Z- Downgraded to tropical storm after crossing Taiwan and weakening due to land effects.

250000Z- Final warning - (extratropical) - as cyclone merged with a frontal boundary while approaching the Korean Peninsula.

## III. TRACK AND MOTION

Ofelia developed in the monsoon trough in the central Caroline Islands and tracked westward along the periphery of the subtropical ridge. On 19 June the tropical cyclone slowed and executed an abrupt track change to the northwest. Although the NOGAPS 500-mb analysis (Figure 3-06-1) at 190000Z June failed to show any significant reason for the track anomaly, the 850-mb analysis (Figure 3-06-2) revealed the presence of 30 to 40 kt (15 to 21 m/sec) southwesterly flow. Since the heights and

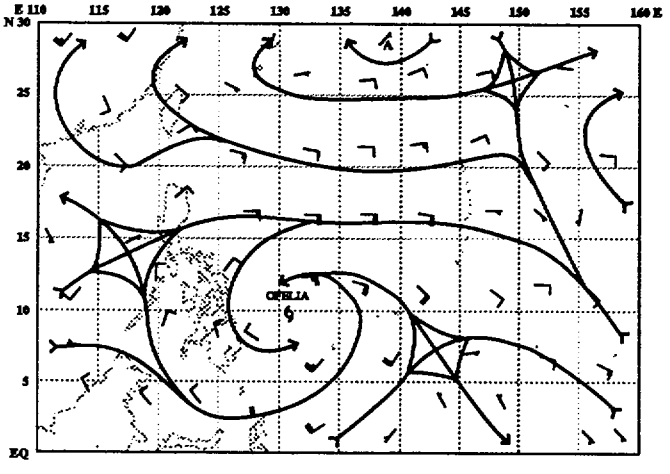


Figure 3-06-1. The 190000Z June NOGAPS 500-mb analysis shows a roughly balanced flow around Ofelia.

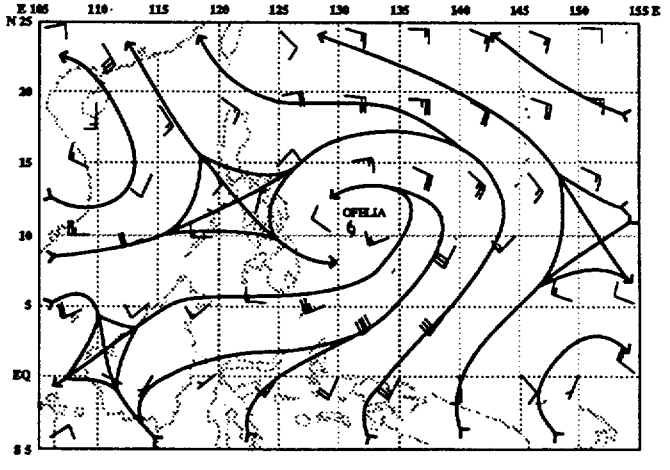


Figure 3-06-2. The 190000Z June NOGAPS 850-mb analysis reveals a stronger southwesterly inflow into the tropical cyclone.

patterns of the subtropical ridge to the north were relatively unchanged, it appears that the start of a shallow monsoon surge from the southwest into Ofelia disrupted the normal steering current. By 20 June a balance between the monsoon steering and the ridge steering had returned, and the tropical cyclone continued tracking around the ridge. On 22 June, when Ofelia was in the Bashi Channel between Luzon and Taiwan, the southwesterly monsoon flow at 850mb (Figure 3-06-3) broadened and reached 50 kt (26 m/sec) over the central Philippine Islands. This flow also deepened through the middle troposphere, where 40 kt (21 m/sec) winds appeared on the 500-mb analysis (Figure 3-06-4). It appears that as Ofelia approached 20° north latitude, the strength of the surge temporarily resulted in a more northward track. Soon after, the typhoon took a northwestward slide across Taiwan, then reached the axis of the subtropical ridge and began recurving toward Korea.

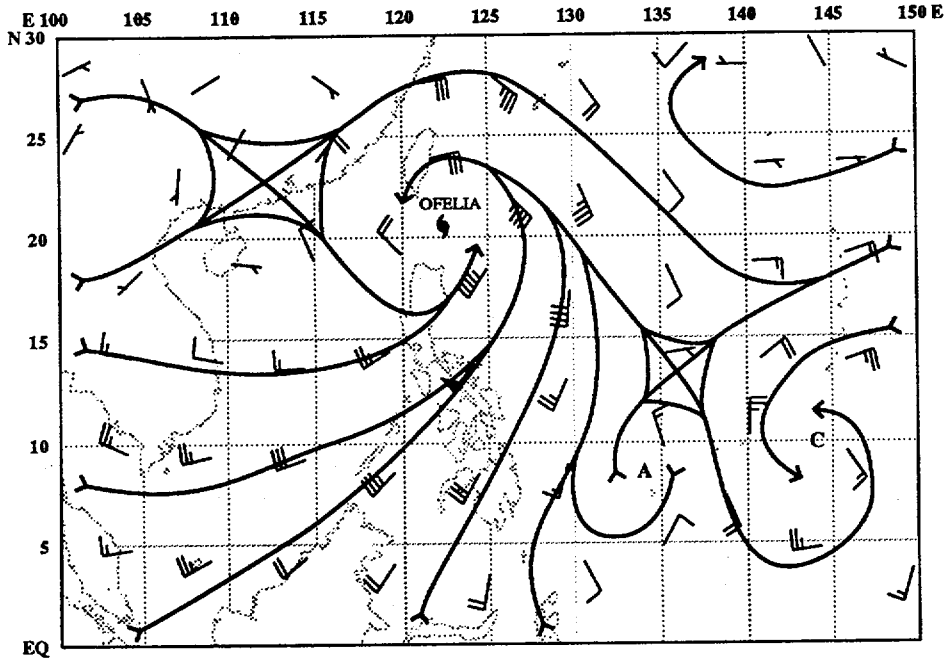


Figure 3-06-3. The 221200Z June NOGAPS 850-mb analysis shows the broad southwest monsoon flow with 50 kt (26 m/sec) across the central Philippine Islands.

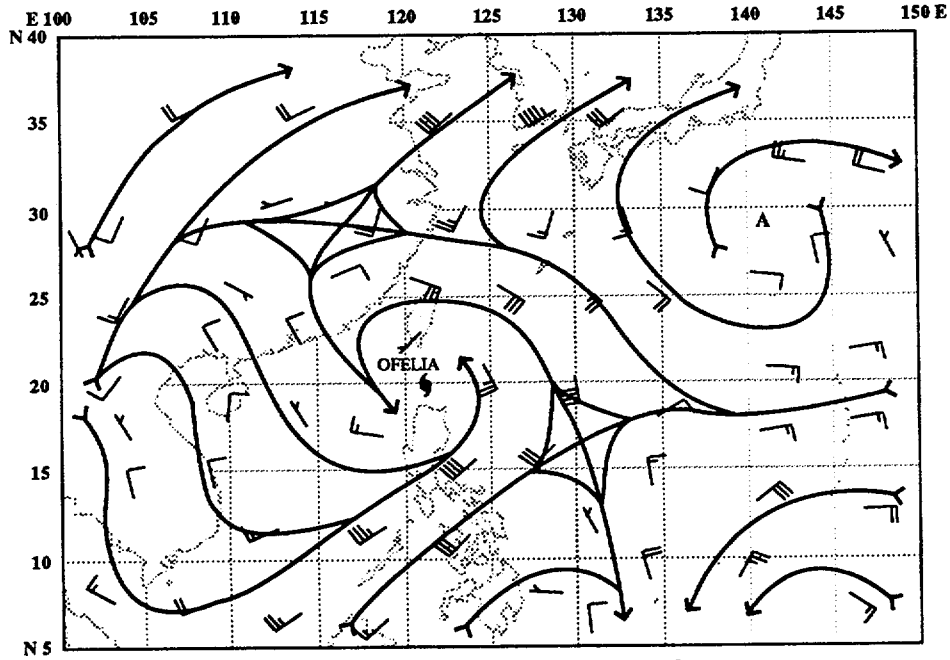


Figure 3-06-4. The 221200Z June NOGAPS 500-mb analysis indicates that the southwesterly flow extends well up into the middle troposphere.

IV. INTENSITY

The tropical depression which was to become Ofelia was initially slow to develop due to vertical wind shear from the northeast. As the southwesterly inflow into the tropical cyclone increased and deepened, an anticyclone formed aloft and the vertical wind shear decreased. Ofelia (Figure 3-06-5) intensified at a slower than average rate and peaked at 90 kt (46 m/sec) (Figure 3-06-6), five days after reaching tropical storm intensity. Part of this slower than average rate was caused by land influences from the Philippine Islands to the west of track. Rapid weakening after 230000Z was caused by land interaction, as the cloud system crossed the mountainous island of Taiwan and moved northward over the China coast.

V. FORECASTING PERFORMANCE

The NOGAPS series kept the subtropical ridge across the Philippine Sea north of the cloud system and linked it to the ridge over central China. JTWC initially expected a more westward track for the system, and continued to forecast the track too far to the west until the system approached Taiwan (Figure 3-06-7). The bias to the west of track appeared in the NOGAPS guidance and suggests that the influence of the strength and depth of the southwest monsoonal flow on Ofelia may not have been correctly addressed by the NOGAPS model.

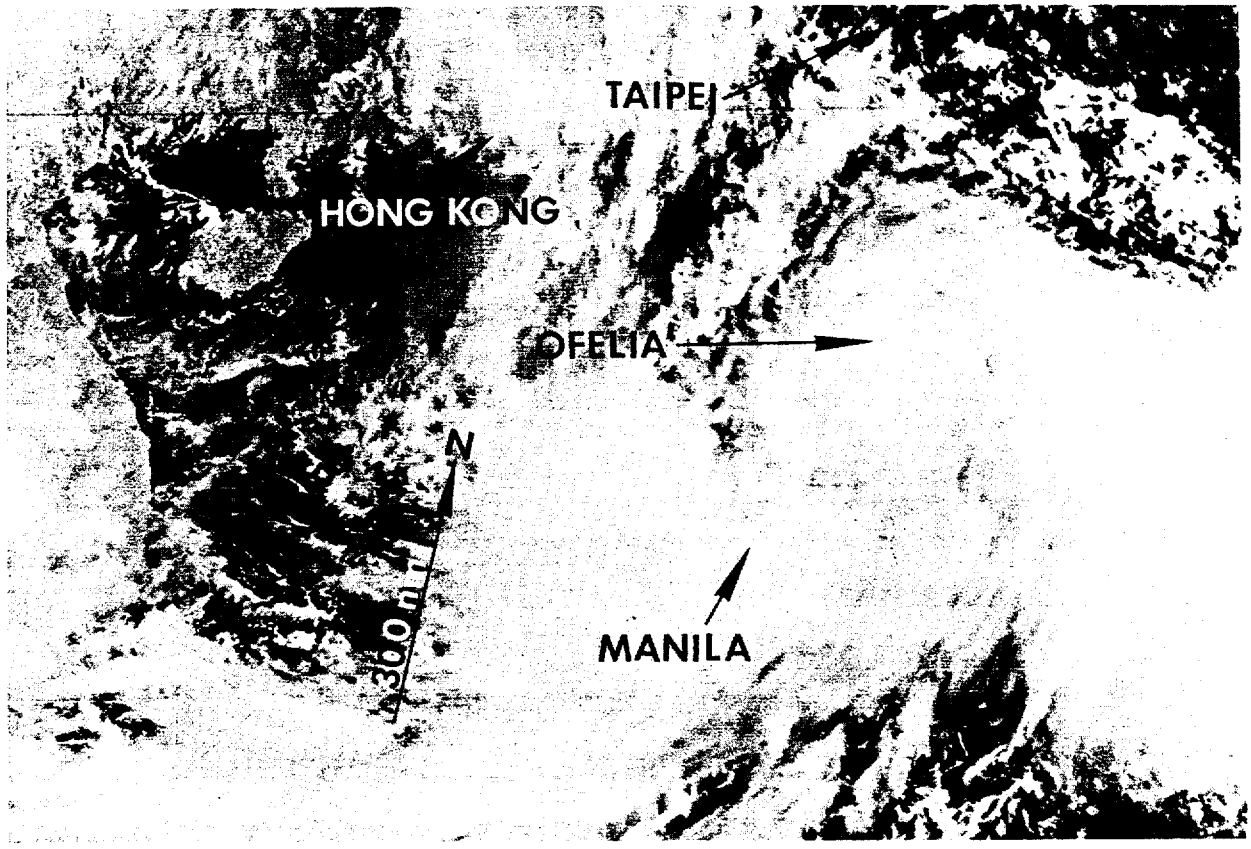


Figure 3-06-5. Typhoon Ofelia is located north of Luzon. The overcast conditions over the Philippine Islands are associated with the deep southwesterly inflow into the typhoon (220124Z June DMSP visual imagery).

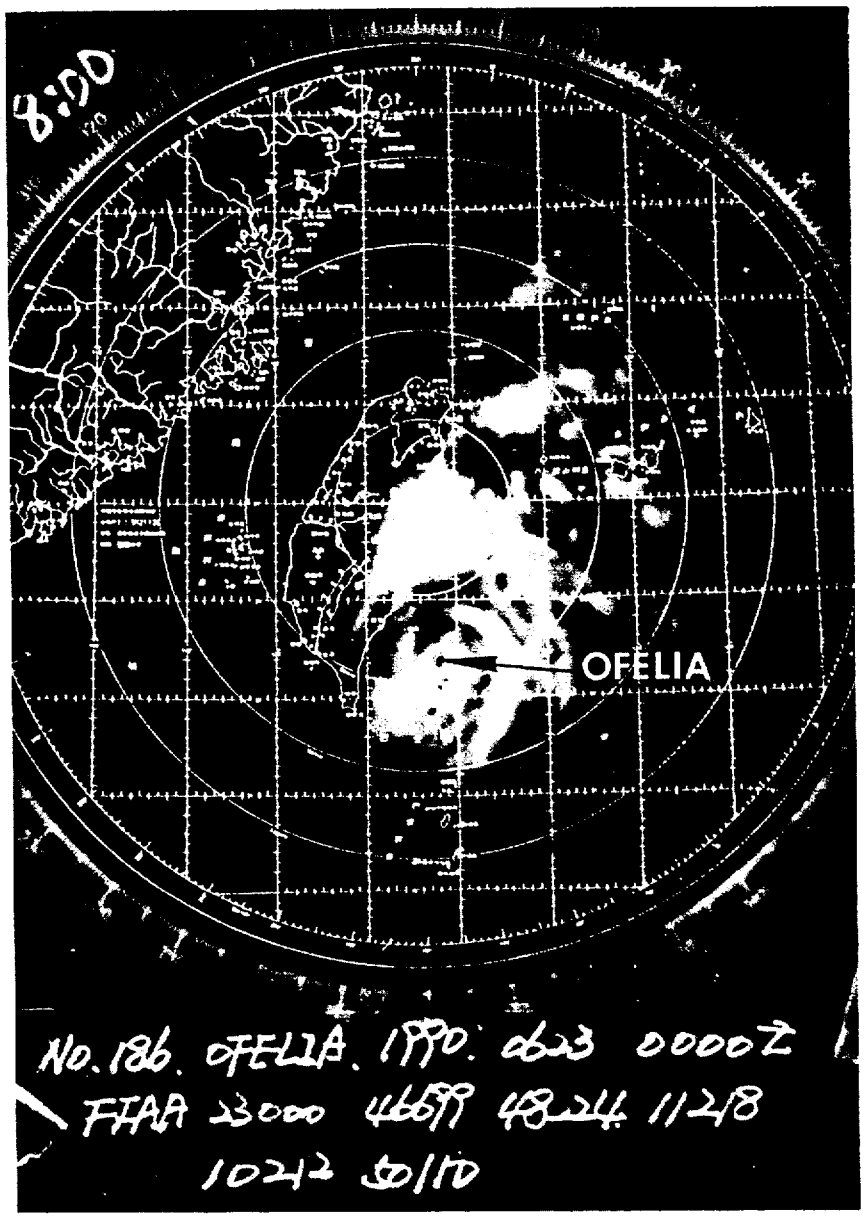


Figure 3-06-6. The 230000Z June radar image from Haulien, Taiwan (WMO 46699) of Ofelia at peak intensity. A small eye is present (radar photo courtesy of the Central Weather Bureau, Taipei, Taiwan).

## VI. IMPACT

Ofelia was a destructive system. Although it didn't cross directly over northern Luzon, the system caused a surge in the southwest monsoon which resulted in torrential rains and widespread flooding in the northern Philippine Islands. Newspaper reports indicated that more than 25 people died and over 84,000 were forced to flee their homes. Taiwan took a direct hit from Ofelia. Media releases said the storm was the worst to hit eastern Taiwan in 30 years. Seventeen people died and 23 were missing due to floods and mud slides. In central China, at least 22 were killed as Ofelia, which caused flooding to low-lying provinces, moved up the coast.

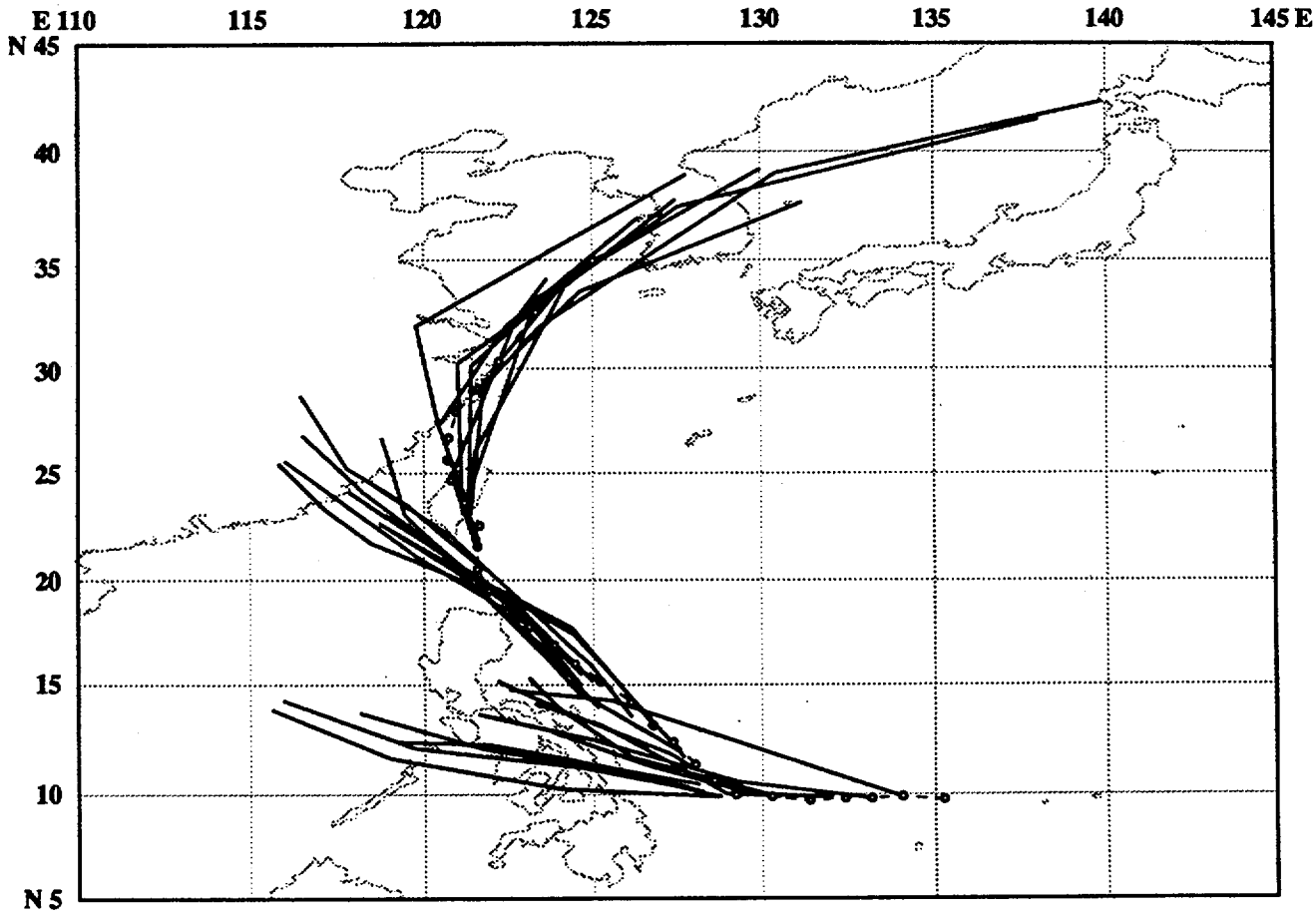


Figure 3-06-7. Summary of JTWC forecasts (solid lines) for Ofelia are superimposed on the final best track (dashed line).